

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference <b>CJS0634</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/US00/24025</b>	International filing date (day/month/year) <b>01/09/2000</b>	Priority date (day/month/year) <b>03/09/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>G02F1/133</b>		
Applicant <b>KENT STATE UNIVERSITY et al.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  <b>28/03/2001</b>	Date of completion of this report  <b>21.11.2001</b>
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016</b>	Authorized officer  <b>Diot, P</b>  Telephone No. +31 70 340 3282  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/US00/24025

**I. Basis of the report**

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1,2,4-15 as originally filed

3,3a as received on 26/10/2001 with letter of 26/10/2001

**Claims, No.:**

1-29 as received on 26/10/2001 with letter of 26/10/2001

**Drawings, sheets:**

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
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International application No. PCT/US00/24025

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

**see separate sheet**

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 19-24.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 19 are so unclear that no meaningful opinion could be formed (*specify*):  
**see separate sheet**

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasons stated under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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International application No. PCT/US00/24025

**1. Statement**

Novelty (N)	Yes:	Claims	6-13, 16-18, 26-29
	No:	Claims	1-5, 14, 15, 25
Inventive step (IS)	Yes:	Claims	6-13, 16-18, 26-29
	No:	Claims	1-5, 14, 15, 25
Industrial applicability (IA)	Yes:	Claims	1-18, 25-26
	No:	Claims	

**2. Citations and explanations  
see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**R Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

see Item VIII

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The amendments filed with the International Bureau under Article 19(1) introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT.

The amendments concerned are the following:

-In claim 1, line 9 "separate and distinct".

-In claim 19, line 10 "first phase separation" and,  
line 13 "second phase separation". (Furthermore it is noted that since the liquid crystal is mixed in either said first or second mixture" (claim 19, line 7), it is not clear how a phase separated process could be initiated in the first and second mixture.)

-In claim 25, lines 7-8 "wherein said liquid crystal material is distributed non-randomly relative to said polymer and polarization sensitive material".

Reference is made to the following document:

D1: JAIL<sup>N</sup> S C ET AL: 'A TECHNIQUE TO ALIGN LIQUID CRYSTALS BASED ON BULK-INDUCED PHOTO-POLYMERIZATION' MOLECULAR CRYSTALS AND LIQUID CRYSTALS SCIENCE AND TECHNOLOGY. SECTION A. GORDON AND BREACH PUBLISHERS, CH, vol. 288, 1996, pages 153-160

A. Document D1 discloses: a method for fabricating simultaneously a phase separated organic film with alignment, comprising: (see Do, chapter EXPERIMENTAL) preparing a mixture of liquid crystal, prepolymer and a polarization-sensitive

material;  
disposing said mixture on a substrate; and  
applying a polarized light from a light source and inducing simultaneous phase separation of said mixture and alignment of the phase separated liquid crystal so as to form a layer of homogeneously aligned liquid crystal material adjacent a layer of polymer and said polarization-sensitive material on said substrate.  
(see D1 page 159. lines 02-04 " It was reasonable to conclude that an ultra thin layer of the photopolymer network gets deposited on the glass substrate during photopolymerization") .

Thus, the present application does not satisfy the criterion set forth in Article 33(2) PCT because the subject-matter of claim 1 is not new in respect of the prior art as defined in the regulations [Rule 64(1) - (3) PCT]:

The same applies for independent device claim 25.

Dependent claims 2-5 are known from D1; see chapter EXPERIMENTAL.  
In D1 the mixture is heated (above the clearing point) during UV irradiation, thus subject-matter of claims 14 and 15 is not novel.

B. Claim 7 relates to a device where the second substrate is covered by a mixture of a prepolymer and a polarization sensitive material. Subject-matter of claim 7 appears to be novel over the prior art D1. However it is not clear which problem is solved by this feature.

### **Re Item VIII**

#### **Certain observations on the international application**

The application does not meet the requirements of Article 6 PCT for the following reason:

Claim 19 (and dependent claims 24) are not clear.

A. The present application/invention refers to a method for fabricating aligned liquid

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crystal cell/film by simultaneous photo-alignment and phase separation (see page 4, lines 06-08).

The problem solved by the present application/invention allows to obviate the need for the preparation and processing of a separate and distinct alignment layer (see page 3, lines 29-31) (like in the well known Liquid Crystal cell).

B. However claim 19 which seems to refer to the multi-step method (as far as the examiner was able to understand claim 19) relates to a method where a substrate is coated and treated (as in the one step method) to produce an alignment layer. (see description page 11, lines 18-19)

This statement contradicts the statement of the problem solved by the invention as mentioned in paragraph A. above.

C. Original claim 19 stated "initiating a process to said first mixture... and initiating a process to said second mixture .... said process imparting orientation alignments to said liquid crystal.

However it is not clear which process(es) are implied by the word process. is that a process a simultaneous phase separation and photo- alignment and in this case the process is initiated by polarized light and not by thermal or solvent induction (contrary to the feature in claim, 19 line 11-12) and in this case the liquid crystal is mixed in both the first and second layers (contrary to the feature in claim 19, line 7) (in the application phase separated refers to phase separated liquid crystal).

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following document:

D1: JP 11153787 (FUJI) Published 08.06.1999 and family member US 6083575 published 04.07.2000.

The document D1 is regarded as being the closest prior art to the subject-matter of independent claims 1 and 25, and discloses (the references in parentheses applying to this document): a cell, comprising: at least one substrate; and a mixture disposed on said substrate, said mixture comprising at least a liquid crystal material, a prepolymer material and a polarization-sensitive material (photodimerizable structure), forming a microstructure of polymer (a polymer dispersed) that imparts alignment properties to said liquid crystal material.

Thus, claim 25 is not novel over D1.

The feature " simultaneous polymerization and application of polarized light causes phase separation and photo-alignment of said mixture" is a feature of a method and cannot further characterize the device.

Method claim 1 is also not novel since it is clear from US 6083575 (see column 9, lines 48-63), that the action of phase separation and photodimerization (photoalignment) occurs simultaneously.

The features of dependent claims 2-6 and 16-18 appear to be obvious to the skilled person.

**Re Item VI**

**Certain documents cited**

US 6083575



**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

**Re Item VIII**

**Certain observations on the international application**

- It is clear from the description on pages 8, line 08 to page 9, line 25 that the following feature is essential to the definition of the invention:

(1) applying polarized light and inducing simultaneously phase separation of said mixture and alignment of the phase separated liquid crystal.

Since independent claim 19 does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

Although claims 19 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Hence, claim 19 and dependent claims 20-23 do not meet the requirements of Article 6 PCT.

In order to overcome this objection, it would appear appropriate to file an amended set of claims defining the relevant subject-matter in terms of a single independent claim in

each category followed by dependent claims covering features which are merely optional (Rule 6.4 PCT).

- Subject-matter of dependent claims 7- 13 and 26-29 appears to relate to a method (and device) where a separate alignment layer is manufactured to provide alignment of a liquid crystal layer deposited in contact with it. However such an embodiment contradicts the description and the problem underlying the invention that "the need for preparation and processing of a separate and distinct alignment layer is obviated" (page 3, lines 27-30).  
As a result these dependent claims are not clear.

- The dependency of claim 24 is not clear. Claim 24 which depends of claim 17 refers to an induction process. However there is no reference to an induction process in claim 17, 16 , 1.

**I. Basis of the opinion**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*):

**Description, pages:**

1-15 as originally filed

**Claims, No.:**

1-29 as originally filed

**Drawings, sheets:**

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application,

☒ claims Nos. 14,15,

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 14,15.

2. A written opinion cannot be drawn due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☒ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)

Claims 1,25

Inventive step (IS)

Claims 2-6,16-18

Industrial applicability (IA)      Claims    1-29

2. Citations and explanations  
**see separate sheet**

**VI. Certain documents cited**

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**